Neuroscience Update1995

by Robert P. Pula


Since my first scheduled lecture at an Institute seminar (1967) I have urged participants to keep abreast of developments in the neurosciences. Given the neurological underpinnings of Korzybski’s neurolinguistic/neurosemantic formulations, that has seemed to me a necessary minimum for our ongoing evaluations of general-semantics derived (mainly) from what Korzybski wrote in 1933. We accept the responsibility to re-formulate whatever in his early text seems no longer compatible with recent findings in any of the sciences he drew on to build his system – and to re-evaluate and re-formulate whatever in the derived/invented system may seem flawed, given those new findings.

Parallel to those lectured urgings, I have written much on the subject, most notably in reviews of neuroscientific books. [1] I propose to do that here, not limiting myself to one text, but evaluating the three variably recent publications listed above.

First, a general evaluation, reflected in the not-chronological order in which the books are listed. All three make important reading and study for the general-semantics practitioner. Edelman’s book, however, strikes me as the most rigorously scientific, the most daring, and the one that most strongly and specifically validates Korzybski’s discussions of neurology in general, the mechanisms of abstracting, and his still revolutionary and structurally sound neurolinguistics. Let’s examine the books in sequence.

Gerald Edelman, a Nobel Laureate (1972, for work on the immune system) is Director of the Neurosciences Institute and Chairman of the Department of Neurology at the Scripps Research Institute. He knows whereof he speaks, but more importantly, he knows what not to say. This frees him from neo-Cartesian and mystical attempts to ‘explain’ the ‘mind’. Beginning with clearly understood notions, hunches and hypotheses, he is vigorously satisfied to describe what he has done, what he has seen, and to draw conclusions and formulate subsequent hypotheses and theories strongly derived from his activity, the better to proceed to further investigation, further hypothesizing, testing, etc. Dr. Edelman seems consistently aware that it is he who speaks/writes and, therefore, takes responsibility for it. His neurolinguistic sensitivity leads me to suspect that he knows that “the word is not the thing” and that “structure is the only content of knowledge.” He comes across as a forthright non-essentialist.

In his brief Preface he claims that “this is not a scientific book, at least not in the strict sense.” By that I understand (as he says) that he deems the book not as technical and cautious as a more severely formal exposition might be. Nevertheless, I wish he hadn’t made that disclaimer, because I see his
presentation as permeated with scientific orientation and rectitude. He does, though, still have the 
useless term 'mind' in his active vocabulary; perhaps in later work he will be content to limit himself 
to the structurally appropriate term "brain," since that's what he's talking about. Similarly, I regret his 
misleading, poetic title (but not the punning subtitle); the title seems one that might show up in the 
"New Age" section of a bookstore. Well, perhaps that might be a good thing, those readers being much 
in need of extensional instruction.

Part 1 of Bright Air, Brilliant Fire is called "Problems" with the sub-chapters named "Mind," 
"Putting the Mind Back in Nature," and "The Matter of the Mind." I was pleased to see a 'quote' from 
me in the abstract that introduces Part I: "... there has never been a solidly established demonstration 
of a mind without a body,..." Of course, Edelman isn't quoting me (he's never even heard of me), but 
I have repeatedly said those very words in teaching general-semantics students to combat the 
elementalism of "mind and body" with, at minimum, the hyphenated "mind-body." I have evolved to 
the point now where I recommend dismissing the term 'mind' from one's vocabulary altogether; it's 
neither appropriate nor necessary and only generates confusion. "Brain" (evaluating mechanism, 
semantic reactor, etc.) serves well.

Chapter 1 ("Mind") is a fine historically based statement of the "problem." Ranging from Descartes 
to Brentano, William James and Darwin, he addresses the question of why we are concerned about this 
stuff anyway. On pp. 5-6 he states "... we want to find out how the mind relates to matter, particularly 
to the special organization of matter that underlies it." (Those are my italics.) In my view, reflecting 
my accelerating tendency toward what I call "unisubstantialism," [2] no matter, no 'mind': i.e., if there 
be no matter, there be no 'mind'. (Please note that this is quite different from the famous, dismissive 
"No matter, never mind.") As far as I'm concerned (1995), 'spiritual' experiences constitute nervous-
system events. When the nervous system goes (death), they go too.

Chapter 2 returns to the "beginnings of modern science" with the post-Copernicans Descartes and 
Galileo, emphasizing the developing dominance of self-challenging scientific method over the prior (but 
still with us) free-wheeling 'philosophical' approach traceable in the West back at least to the pre-
Socratics. Of greatest interest for a general-semanticist reader might be the evaluation (pp. 13-15) of 
"cognitive science," its reliance on Chomskyian notions, and, cripplingly it would seem, the assumption 
of many of its practitioners that they can formulate responsibly (in a structurally sound way) without 
a central concern for the bio-physical structures and mechanisms of the brain. "One of its most curious 
deficiencies is that it makes only marginal reference to the biological foundations that underlie the 
mechanisms it purports to explain. The result is a scientific deviation, ... . The critical errors 
underlying this deviation are as unperceived by most cognitive scientists as relativity was before 
Einstein and heliocentrism was before Copernicus." (p. 14) - or neurolinguistic issues before 
Korzybski. Let's re 'mind' ourselves of John Searle's caveat: "... all sorts of disciplines that are quite 
unlike physics and chemistry are eager to call themselves 'sciences'. A good rule of thumb to keep in 
mind is that anything that calls itself a 'science' probably isn't - for example, Christian science, or 
military science, and possibly even cognitive science or social science." [3] Or political science. Or 
thology (the "Queen of the Sciences"). Or economics. Or, as too-often practiced, general-semantics.

"The Matter of the Mind" (Chapter 3) is a central one, for here Edelman bravely faces up to 
affirming the 'material' (unisubstantial, say I) character of the brain and all its processes. Some of his 
concluding statements (pp. 29-30): "These [brain] dynamics result from a special chemistry. 
Alterations of that chemistry or destruction of its anatomical substrate can lead to temporary or
permanent mental changes from elation to unconsciousness to death.”; “... it is the dynamic arrangement ['structure' in the Korzybskian sense] of these substances to create mental processes, not their actual composition, that is essential. It is dynamic morphology all the way down.” And, having questioned the value of explaining ‘mental properties’ at the quantum level (though, surely, that remains the ‘lowest’ level of analysis which subtends ‘mental properties’), he concludes:

If strict biochemical chauvinism is out, however, so is the liberalism of the computer scientist who assumes a brain software that actually does not exist a priori and then claims that it doesn’t matter what structure [organized hardware: RPP] this software runs on. He makes two fundamental errors, for there is no such thing as software involved in the operation of brains, and the evidence overwhelmingly indicates that the morphology of the brain matters overwhelmingly.

I would like to watch Noam Chomsky reading that.

Having laid his turfwork, Edelman presents Part II, “Origins,” with its chapters (4 through 7) entitled “Putting Psychology on a Biological Basis,” “Morphology and Mind: Completing Darwin’s Program,”* “Topobiology: Lessons from the Embryo,” and “The Problems Reconsidered.” The abstract to Part II contains these telling statements: “... Darwin proposed that minds arose by evolution. What this means is that minds have not always been around [my italics: RPP]: they appeared at some definite time in a series of graded steps.... At the ‘brain of the matter’ is the most complicated arrangement in the known universe.”

A bonus in Bright Air, Brilliant Fire is the quoted material that heads each chapter. The header for Chapter 4, “Putting Psychology on a Biological Basis,” includes this: “The mania for handling all sides of every question, looking into every window, and opening every door, was, as Bluebeard judiciously pointed out to his wives, fatal to their practical usefulness to society.” (Henry Adams) Ah, “You can’t say all about anything.” Determine (limit) your domain of investigation and discourse – and remember that you’ve done it.

The thrust of this chapter is that sound psychology as a study, discipline, and practice must be anchored in biology, lest it become and remain (as J. Allen Hobson claims for, at minimum, Freudian psychoanalysis) a form of literary criticism. [*] Edelman adds that “The phenomena of psychology depend on the species in which they are seen, and the properties of species depend on natural selection.” (p. 40) So much for Walt Disney. “The fundamental basis for all behavior and for the mind is animal and species morphology (anatomy) and how it functions.” (p. 41) Edelman is not maintaining here that there are not social, cultural, etc., determinants of behavior, but that the fundamental determinants are precisely the stuff out of which behavior emerges.

Those two quotes from the book lead to Edelman’s updating of Charles Darwin’s contributions, “Morphology and Mind: Completing Darwin’s Program” (Chapter 5), itself a preparation for presenting

* “what we need to know in order to understand the evolutionary origins of the human mind ... how the morphology underlying behavior arose during evolutionary history, and how behavior itself alters natural selection.” (pp. 44-45)
the core of Edelman’s program, “Neural Darwinism” in Chapter 9 (pp. 81-98). Readers who want to study Edelman fully will do well to see his earlier book, *Neural Darwinism*. [5]

Chapters 5 through 11 present much of what we can call Edelman’s ‘hardware’ descriptions, without implying acceptance of the computer (hardware/software) analogy of the brain (which, as we’ve seen, Edelman doesn’t either). And herein we see many of his most original and most daring formulations related to the structure/function of neural stuff. He quite explicitly describes what he has abstracted during and after his laboratory work. And, a main reason why I selected this book for review, he specifies neural behavior in ways that are remarkably supportive of the neurolinguistic analyses and assumptions of general-semantics. I won’t re-present his rich, rich pages here. You will (ought to) read them for yourself. What I will do is list some Korzybskian insights and hunches which are congruent with Edelman’s recent laboratory-derived formulations. But first, here is a quote that might send general-semanticists rushing from their studies to buy the book:

Neuronal group selection occurring within maps leads to the production of new kinds of signals, which can then be reentered into earlier maps along with signals from the outside world. This property of reentry allows for what I have called recursive synthesis: Not only are events correlated topographically across different maps without a supervisor, but new selectional properties emerge through successive and recursive reentry across maps in time. (p. 89).

[See also Hofstadter’s discussion of loops and recursive structures listed in reference 1 in the endnotes.]

And, again on p. 89:

*How can reentry account for perceptual categorization, the function that TNGS [Theory of Neuronal Group Selection] takes to be fundamental in any attempt to relate physiology to psychology? The brief answer is: By coupling the outputs of multiple maps that are reentrantly connected to the sensorimotor behavior of the animal. This is achieved through a higher order structure called a global mapping. A global mapping is a dynamic structure containing multiple reentrant local maps (both motor and sensory) that are able to interact with nonmapped parts of the brain. ... a global mapping allows selectional events occurring in its local maps to be connected to the animal’s motor behavior, to new sensory samplings of the world, and to further successive reentry events.*

The specificity that Edelman is capable of is demonstrated in an explanatory footnote, also on p. 89 – what a page!

*When a visual stimulus of the right type (a lit bar moving up and to the right) is present, the responses of the neuron and its neighbors all oscillate at the same frequency (forty hertz, or forty cycles per second). When the stimulus is removed, the spikes and field potentials no longer correlate.*

Here are some congruent Korzybskian formulations (not ‘all’) as I choose to state them in 1995:

The brain is a multi-level mapping system.
A map is not its presumed territory.
A map does not (cannot) represent all of the presumed territory.
Maps are self-reflexive, i.e., recursive and self-referring. We can make coordinated maps of maps indefinitely.

"Structure is the only 'content' of knowledge." (Korzybski)

The understanding of multiordinal terms, structures and mechanisms is necessary for adequate evaluating/formulating.

The nervous system/brain manifests feedback mechanisms, (Edelman's "reentrant circuits, connections, pathways, signaling," and "reentrant cortical integration model") including neurolinguistic feedbacks, which modify (restructure) the brain, all this expressed as further recursive behavior, attitudes, perceptions, orientations, etc.

Understanding of "combinations of higher order" (not merely statistical masses) is necessary for understanding the combinatorial functions of the brain (nervous system as a whole).

Categories emerge from behavior.
Categories constitute behavior.
Abstracting is neuro-structurally determined.

The titles of the Chapters in Part 11 that I have just alluded to are "Topobiology: Lessons from the Embryo" and "The Problems Reconsidered," (Chapter 7) i.e., the problems related to how to formulate about the brain. Within Part III, "Proposals", are "The Sciences of Recognition" (Chapter 8), "Memory and Concepts: Building a Bridge to Consciousness" (Chapter 10), and "Consciousness, The Remembered Present" (Chapter 11). In Chapter 10 he quotes Wittgenstein as affirming 'Concept' is a vague concept," and comes close to my contention that 'consciousness' qualifies as a characteristic of complex neural systems, just as relative 'hardness' is said to be a characteristic of certain rocks, and 'color' a resultant from the interaction of extra-neural frequencies and the frequencies of the visual centers of some brain; in other words, that 'consciousness' can be understood as a characteristic quite like 'eye color', and not beyond the realm of bio-physics, surely not a-physical or 'supernatural'.[?

But I can't just allude to Chapter 9, "Neural Darwinism," which Francis Crick prefers to call "Neural Edelmanism."

A key notion of neural Darwinism is that brain science is a science of recognition but that "... recognition is not an instructive process. No direct information transfer occurs, just as none occur in evolutionary or immune processes. Instead, recognition is selective." (p. 81) Apparently, stuff happens. As Shakespeare wrote, perhaps 'knowing' more than he recognized, "We are such stuff as dreams are made on, ..." Here we have Edelman at his most theoretical, most daring, and, therefore, most important.

As the dust jacket to his Neural Darwinism has it, "Its central idea is that the nervous system in each individual operates as a selective system resembling natural selection in evolution." Here we have a highly specified (but related to genuine 'deep structures') formulation of (personal) "ontogeny recapitulates phylogeny." And, if individual nervous systems act as selective systems, we have a strong neuroscientific underpinning and 'validation' for the inevitability of individuality and individualism within the human species given (eventually) to the communal-cooperative behavior that Korzybski called "time-binding." Nervous system , is not nervous system , etc., even if they do co-operate within the 'same' group.
But what does Edelman intend by "selection" in this context? First, we must consider "population thinking" (Chapter 8), a mode of 'thought' in biology "developed largely by Darwin" in which variation is seen not as an 'error' but as a prerequisite source of "... diversity on which natural selection acts to produce different kinds of organisms."

As Jacob Bronowski observed in The Ascent of Man:

This contrasts starkly with Platonic essentialism, which requires a typology created from the top down; instead, population thinking states that evolution produces classes of living form from the bottom up by gradual selective processes over eons of time. (p. 73)

Other key terms Edelman uses in special ways for his purposes are "instruction," "recognition," and "memory" or [n.b.] "heritability." By "recognition" he intends "the continual adaptive matching or fitting of elements in one physical domain to novelty [my italics: RPP] occurring in elements of another more or less independent physical domain, a matching that occurs without prior instruction." [Again, my italics. Consider dynamic map-territory relationships at this level as constituting a process whereby changes are elicited, teased out, derived (synthesized) ex post facto. An interactive, reciprocal bottom up and top down system; "top down" since what is adapting-selecting must be structurally 'predisposed' to so adapt-select: RPP.] "The process of adaptation occurs by selection on those organismal variants that are on the average fittest, and what makes them fittest does not require prior explicit information ("instruction") ..." It is important that we, especially we general-semantics readers, remember levels (orders) of abstracting as we read this. What Edelman seems to be saying here is that at this level "selection" represents the blind operation of a matching (structural compatibility) mechanism of evolution, both group and individual. A sort of dynamic bio-templating, powered by the structure-eliciting effects of the sun.

Evolution works by selection, not by instruction. There is no final cause, no teleology, no purpose guiding the overall process, the responses of which occur ex post facto in each case. (p. 74)

And further:

"... evolution, acting by selection on populations of individuals [statistically relevant: RPP] over long periods of time, gives rise to selective systems within individuals. Such selective systems acting in one lifetime in one body are called somatic selective systems. Thus, an evolutionary selective system selects for a somatic selective system! (p. 74)

Levels. Orders. An example of evolved, selected, consciousness of multiordinal abstracting.

Chapter 9, "Neural Darwinism" presents one of the best arguments I know of against the "homunculus" acting as chief programmer and referee in the brain: [7]

A potent additional reason for adopting a selective rather than an instructive viewpoint has to do with the homunculus. You will remember that the homunculus is the little man that one must postulate "at the top of the mind," acting as an interpreter of signals and symbols in any instructive theory of mind. If information from the world is processed by rules in a
computerlike brain, his existence seems to be obliged. But then another homunculus is required in his head and so on, in an infinite regress. Selectional systems, in which matching occurs ex post facto on an already existing diverse repertoire, need no special creations, no homunculi, and no such regress. (p. 82)

Again on page 82, Edelman summarizes his position and its theoretical implications:

If we assume that brain functions are built according to a selectional process, we must be able to reconcile the structural and functional [structural-functional: RPP] variability of the brain with the need to explain how it carries out categorization. To do so we need a theory with a number of essential characteristics. It must be in accord with the facts of evolution and development; account for the adaptive nature of responses to novelty; show how the brain’s functions are scaled to those of the [rest of the: RPP] body as the body changes with growth and experience; account for the existence and functions of maps in the brain – why they fluctuate, how multiple maps lead to integrated responses [cortico-thalamic integration?: RPP], even in the absence of language. Eventually, such a theory would also need to account for the emergence of language itself. And finally, such a theory must account for how the various forms of perceptual and conceptual categorization, of memory, and of consciousness arose during evolution.

To be scientific, the theory must be based on the assumption that all cognition and all conscious experience rest solely on processes and orderings occurring in the physical world. The theory must therefore take care to explain how psychological processes are related to physiological ones.

The theory I have proposed to account for these matters is known as the theory of neuronal group selection (TNGS).

We can call this “Edelman’s Program.” He spends the rest of the book specifying it and making what I see as a very strong case for its viability. I allege that I have detailed enough so far to convince a general-semantics readership that Dr. Edelman’s book qualifies as an immediate ‘must’ for their current reading. In the remaining space that I can take for this part of my review (I can see Editor Mayper looking skyward), I will list the chapters not yet referred to and point to a few formulational, general-semantics-related highlights not yet touched on: “Language and Higher Order Consciousness” (Chapter 12); “Attention and the Unconscious” (Chapter 13); “Layers and Loops: A Summary” (Chapter 14). Chapters 8 through 14 constitute Part III of the book.

Part IV, “Harmonies” comprises “A Graveyard of Isms: Philosophy and Its Claims” (Chapter 15); “Memory and the Individual Soul: Against Silly Reductionism” (Chapter 16); “Higher Products: Thoughts, Judgments, Emotions” (Chapter 17); “Diseases of the Mind: The Reintegrated Self” (Chapter 18); “Is It Possible to Construct a Conscious Artifact?” (Chapter 19); and “Symmetry and Memory: On the Ultimate Origins of Mind” (Chapter 20). These are followed by an “Epilogue” and “Mind Without Biology: A Critical Postscript.” As we might expect from such a tour-de-force, there is an ample annotated “Selected Readings” section, but there are few notes other than some footnotes and a “Credits” section acknowledging sources of quotations and illustrations.
I wrote in 1970, “That language structures reflect neural structures and, by feedback mechanisms, may ALTER neural structures, is one of the eminently plausible speculations of Korzybski in support of which we have, as yet, insufficient data.” Much of what follows in Edelman’s book provides additional support for what Korzybski was writing from the 1920's through 1950.

Here are some of the remaining highlights: The formulation of “primary” and “higher-order consciousness,” with animals in general limited to primary consciousness, humans showing both, and both specified in terms of neuronal structures.

It is curious that we, as human beings with higher order consciousness, cannot “see the world” with our primary consciousness alone. Creatures with primary consciousness, while possessing mental images, have no capacity to view those images from the vantage point of a socially constructed self. Yet one who has such a self as a result of higher-order consciousness needs it to link one mental image to the next in order to appreciate the workings of primary consciousness! Higher-order consciousness cannot be abandoned without losing the descriptive power it makes possible. (I often wonder whether this abandonment is what some mystics seek.) (p. 124)

The second major nervous system organization is quite different [from the limbic-brain stem system]. It is called the thalamocortical system. (The thalamus, a central brain structure, consists of many nuclei that connect sensory and other brain signals to the cortex.) The thalamocortical system consists of the thalamus and the cortex acting together,...It is very fast in its responses (taking from milliseconds to seconds), although its synaptic connections undergo some changes that last a lifetime....its main structure, the cerebral cortex, is arranged in a series of maps, which receive inputs from the outside world via the thalamus ... It does not contain loops so much as highly connected, layered, local structures with massively reentrant connections. (p. 117)

(Cf. Korzybski’s descriptions of animal and human abstracting (Science and Sanity, pp. 331-334), and his “rough and oversimplified hypothetical diagram,” (Science and Sanity, pp. 193-194), and related discussions of cortico-thalamic integration.)

Inasmuch as human beings are the only species with language, it also means that higher-order consciousness has flowered in our species. But there are strong indications that we can see at least some of its origins in chimpanzees. Both species can think, not just have concepts, and chimpanzees also seem to have some elements of a self-concept. Certainly, the basis for recognizing a subject-predicate relationship in humans requires an emerging consciousness of the distinction between the self (in the social sense of “selfhood”) and other entities classified as non-self. Chimpanzees have behaviors indicating that they make the distinction, but they lack true language and so I claim that what I call higher-order consciousness cannot flourish in them, as it does in us. (p. 125)

Nor, presumably and observably, can time-binding.

Embodiment imposes ineluctable limits. The wish to go beyond these limits creates contradiction, fantasy, and a mystique that makes the study of the mind especially challenging, for after a certain point, in its individual creations at least, the mind lies beyond scientific reach.
Scientific study recognizes this limit without indulging in mystical exercises or illusions. The reason for the limit is straightforward: The forms of embodiment that lead to consciousness are unique in each individual, unique to his or her body and individual history. (p. 136)

Chapter 15 (the first of Part IV) “A Graveyard of Isms: Philosophy and Its Claims,” briefly addresses some of the distinctions that can be made between those social behaviors called philosophizing and those that involve engaging in self-challenging, self-testing, value-driven scientific formulating. Edelman (like Korzybski) rejects the notion of a value-free science, at least for biology: “A biologically based epistemology has no such luxury.” (p. 162)

The last chapter, unnumbered, is titled “Mind Without Biology: A Critical Postscript,” in which Edelman states, “My goal is to dispel the notion that the mind can be understood in the absence of biology.” (p. 211) He points out that this chapter is not just tacked on at the end but presents extensions of points made in the body of the book, “... intended for the experts, but also for the curious who may want to know more.” Indeed, this 42-page chapter qualifies as a monograph in its own right. It, and the text, conclude with this rather Korzybskian clarion: “... through its connections to what makes us uniquely human, a biologically based epistemology will enrich our lives.”

This concludes my extended report on and observations about Gerald Edelman’s Bright Air, Brilliant Fire. I have not covered ‘all’ of what he has to say. The reader may find that what I have left out is more personally instructive than what I have included in this review. There’s one most useful way to find out.

Let’s move now to Patricia Smith Churchland’s Neurophilosophy, the most epistemologically focused of the three books under consideration here. The Bulletin reader may see this one as, at least initially, a primer of contemporary neuroscience. Part I, “Some Elementary Neuroscience”, can serve as a sophisticated text for undergraduates. Like Edelman, she accepts, though perhaps not as flatly, Hippocrates’ ancient formulation of embeddedment: “One ought to know that on the one hand pleasure, joy, laughter, and games, and on the other grief, sorrow, discontent, and dissatisfaction arise only from the brain. It is especially by it that we think, comprehend, see, and hear, that we distinguish the ugly from the beautiful, the bad from the good, the agreeable from the disagreeable. ...” (unnumbered p. ix).

I observe here that she also (who doesn’t?) includes Descartes’ reflex-explaining drawing, as does Edelman above and Rose below, and most others who give a survey of notions in brain study. This gives us further evidence of Descartes’ central position in the long development of modern neuroscience, even if we reject his unfortunate mind/body dualism. As I asked when introducing Karl Pribram at the 1984 Alfred Korzybski Memorial Lecture, “Is it time to put the hearse before Descartes?”


Now I must admit here, that a respected associate, Dr. Russell Meyers (see endnote 1), has opined that there seems much in Patricia Churchland’s presentation that seems ‘amateurish’. But I must also
admit that I don’t agree with that evaluation. Though Churchland is trained in philosophy and is not herself a hands-on (laboratory-trained) neurologist and certainly not a neurosurgeon (as was Dr. Meyers before his ‘retirement’), she seems to have well absorbed what such people have to teach; at the suggestion of her husband, Paul M. Churchland, also a noted philosopher of science [13], she has consulted with many leading researchers. I suspect that Russell Meyers’ quiet lack of enthusiasm may be related to Patricia Churchland’s disparaging of “outdated and discredited positivist ideas” (p. 4) and to her assertion that there is, for neuroscience, “... no Governing Paradigm in the Kuhnian sense.” (p. 6) Russell Meyers would probably insist that we have such a paradigm, though a not-yet “governing” one: general-semantics. [14] We can claim for general-semantics a ‘governing’ role in the sense that it applies to all human evaluating, but we well know that it does not ‘rule’. In any case, it seems to me that Churchland’s presentation constitutes a fine place to start if you haven’t already been there—and even if you have. Her Part I, almost as long as Edelman’s entire book, provides an extensive description of the dynamic ‘hardware’ of the nervous system/brain, in language informed by modern (Korzybski-like) neurolinguistic sensibility. If her language evolves (or is jolted) to a Korzybskian mode, we can expect most structurally sound formulating from her.

For our (well, my) purposes, Parts II and III, where she presents extended discussions of “Recent Developments in the Philosophy of Science” and “A Neurophilosophical Perspective,” seem most pertinent. Together (almost page for page) they constitute the second half of the text, and, especially Part III, expose us to Churchland’s original contributions coming from her neuroscience-influenced philosophical background.

Chapter 6 (the first of Part II) gives an “Introduction and Historical Sketch,” much of which will seem familiar to those who have heard Dr. Stuart Mayper’s Institute seminar-workshop lectures. We sometimes see in students of general-semantics an insufficient awareness of the long tradition of philosophical and scientific writings that Korzybski acknowledged drawing on when, over a period of at least twelve years of intensive labor (1921-1933), he developed and formulated his system. I deem it impossible to put into perspective and to appreciate Korzybski’s (and our) position in the broad sweep of “paradigm shifts” that characterize human formational evolution, without at least a survey knowledge of that evolution. Dr. Churchland provides some of the necessary information in her sixth chapter.

Chapter 7, “Reduction and the Mind-Body Problem,” addresses a central issue for the neurosciences and for any respectable, up-to-date ‘philosophy of mind’; namely, so-called reductionism.

Inevitably the naturalistic approach leads us to inquire into the possibility of a unified theory of the mind-brain, wherein psychological states and processes are explained in terms of neuronal states and processes. [I would like some single quotes there: RPP.] A fundamental question concerning this possibility can be put as follows: Can mental states and processes be reduced to brain states and processes? Can one be a reductionist? [You’d better: just don’t identify, i.e., confuse orders of abstracting: RPP.] ... This is central to my program, for obviously, if reductionism is a hopeless cause, then it would be foolish to search for an explanation of mental states and processes in terms of brain states and processes. (p. 277)

That, I affirm, is tough. Facing up to the issues, clearly, openly, po prostu: (straight from the shoulder).
Patricia Churchland sharply eyes difficulties with the term "reductionism." In a fine aside, she says, "Sometimes it is used as a synonym for 'behaviorism' (which is a case of the vague hounding the vague) or as a synonym for such sins as 'materialism,' 'bourgeois capitalism,' 'experimentalism,' 'vivisectionism,' 'communism,' 'militarism,' 'sociobiology,' and 'atheism.' " Despite these potentially distracting 'connotations', she insists that "reduction" is the most appropriate term for what she intends, namely, a relation between theories such that one theory (or set of phenomena) reduces to (can be explained in terms of) another, more basic, more general theory. She is concerned, by means of this "intertheoretic reduction", to "assess the prospects for reduction of psychological theories to neuroscience." (p. 278)

A consequence of intertheoretic reduction is explanatory unification, and in the sciences such unification is considered a good thing. If one theory can be explained by another and thus reduced to it, then our understanding of the phenomena described by the theory is greatly enhanced. (p. 279)

I suggest here that our notion of reductionism can be enriched and clarified by examining the writings of Tadeusz Kotarbiński on "reism" (i.e., 'thingism') and "concretism," and its derivative linguistic methodology which he calls "semantic reism," which, through reductive transformations, generates "reistically meaningful" sentences. In keeping with its anti-'metaphysical' stance, Kotarbiński's position represents a stern call to responsibility in formulating – a heroically anti-blather position. [15]

Again on page 279, her affirmation that "... there do not yet exist fleshed out neurobiological theories with reductive pretensions," seems on target with relation to neurobiology in general, but Dr. Churchland, apparently not aware of the work of Korzybski and, by extension, Russell Meyers, might find such a fleshed out theory in their writings. Perhaps she has now read Science and Sanity and her more recent writings show it. I will need to search them out. Meanwhile, in the rest of Chapter 7 (indeed, throughout the book), she does an excellent job of engaging the reader in a consideration of how the details of neuroscience (data) can and should inform the generalities of philosophy, particularly "neurophilosophy."

In Chapter 8 Churchland raises a central question, "Are Mental States Irreducible to Neurobiological States?" The reader by this point is likely to be confident that her answer is "No", they are not irreducible, i.e., they are reducible. She fairly, though (and sharply), describes two main schools of objection, the "boggled skeptics" who claim that the brain is too complex for us brains to ever understand 'it', and the substance dualists who claim either that the 'mind' is a nonphysical substance, different altogether from the brain, or that 'mind' represents emergent properties of (from) the brain which are substantially different from the brain; sophisticated Cartesianism taking refuge in the notion of "qualia," i.e., introspective experiences that are not reducible to neural states. (p. 327) Her descriptions are detailed and rigorous and seem to me to fully justify her "Concluding Remarks" on pages 346-347:

The common theme uniting the objections to intertheoretic reduction considered in this chapter has been that mental states are not physical states, either because they are the states of a nonphysical substance or because they are emergent nonphysical states of the brain in the sense that they cannot be explained in terms of neuronal states and processes. None of these objections seems to me compelling. Surprisingly, perhaps, some physicalists have generated
antireductionist arguments of their own from within a broadly physicalist framework. ... these newer arguments share with the older arguments a devotion to the idea that it is because mental states have meaning and because mental states enjoy logical relations to one another that the reductive program is forever thwarted. ... The antireductionist arguments are perhaps more subtle than Popper’s variety [see pp. 259-60, 286, 338-342, 377, and 379. RPP], but their root motivation derives from a common conviction about the irreducibility of intentionality. [Their objections, I take it, would also encompass Korzybski’s “intensionality” with an “s”: RPP]

Since we have (via Stuart Mayper) incorporated discussion of some of Popper’s views in our Institute summer seminar-workshops, I should give some indication of how Churchland treats him.

Karl Popper is an unorthodox logical empiricist who resisted the idea that the body of scientific knowledge accumulates by the confirmation or verification of hypotheses. In a startlingly different picture of the dynamics of science (1935, 1963), ["he argued that hypotheses are worthy of acceptance only if they resist falsification. His point was devastating and simple: it is easy to find confirming instances of hypotheses – too easy for this to be the right methodology. ... in general, I should try as hard as possible to falsify my hypothesis. ... Popper’s claim was that if the scientist accepts hypotheses by finding [only] confirming instances, he will end up believing a great many false hypotheses and following a great many dead ends. On the other hand, if he has a hypothesis that has withstood tough attempts at falsification, then he can accept that hypothesis – not as true, not as confirmed, but as the best hypothesis available so far. (pp. 259-260)

That pretty much encapsulates the aspect of Popper we cover in the seminars; a strong statement of the mechanism, the method of Korzybski’s principle of general uncertainty. Churchland goes on to relate Popper’s exaggerations (“hypotheses are interesting only [my italics: RPP] if they are bold”) and the difficulties in inventing crucial, potentially disconfirming experiments.

She shows Popper to hold that, if disconfirming experiments are difficult, intertheoretic reductions must be even more difficult and, therefore, suspect. But we of the Institute have recognized Popper’s regressive Aristotelianism, not to mention Platonism. So does Patricia Churchland:

The crux of Popper’s argument against reductionism depends on his idea [sic!] that there exists a world of abstract, nonphysical objects with which we interact when we reason, discover a proof for a theorem, find consequences for a physical theory, use language, think about arithmetic or quantum mechanics or Gödel’s incompleteness results. He calls this realm of abstract objects “World 3,” and its denizens include arithmetic objects such as the integers, the irrational numbers, and the relations between them, mathematical objects, logical objects, and relations between them, scientific theories, the as-yet undiscovered proof for Goldbach’s conjecture, and the as-yet undeduced consequences of theories in physics, neuroscience, and so forth. It also contains some “embodied” objects such as books and musical scores. Popper calls the physical world that conforms to physical laws “World 1,” and he claims that mental events and processes belong to a distinct “World 2.” (p. 338)

Churchland continues (pp. 338-340) to detail and critique Popper’s trinitarian formulations. Bulletin readers may find this section especially useful as a cautionary tale, a benchmark of failure against which we may rate ourselves as formulators who strive to be conscious of our own abstracting.
Chapter 9, “Functionalist Psychology” says much about the insufficiencies of “folk psychology.” Indeed, throughout the book she addresses the limitations of almost exclusively intuitive (unanalytical, non-experimental, reluctant to challenge itself) folk psychology, “folk physics,” and “folk theory.” These seem particularly important passages for those general-semanticists who may be inclined to rely uncritically on press and television accounts of scientific happenings, reports of ‘studies’, etc. – and their own in-head preferences. (The reader may avow that a general-semanticist shouldn’t rely uncritically on any reports, studies, etc. I agree.) While showing respect for these ‘folk’ methodologies, pointing out that ‘they’ are where our more sophisticated, evolved methodologies begin, (“Some of the theory may be acquired as we learn the language, ...”) she is concerned to demonstrate how they can be revised and improved. That’s not a bad description of the goals of science in general.

Again, as in Chapter 8 and throughout the book, Churchland’s concern is whether or not psychological levels of description will reduce to neurobiological levels of description, a question that “functionalist” psychologists answer in the negative.

The core idea of functionalism is the thesis that mental states are defined in terms of their abstract causal roles within the wider information-processing system. ...

In general, functional kinds [of states] are specified by reference to their roles or relational profiles, not by the material structure in which they are instantiated. (p. 351)

Functionalist psychologists, in Churchland’s description, do not deny the material realization of ‘mental’ states (i.e., they do not maintain the Cartesian split); they accept that ‘mental’ states are implemented in “neural” stuff, but claim that “types of mental states could have too many distinct material realizations for a reductive mold to fit.” (p. 352) Functionalism, Churchland says, is the dominant theory of ‘mental’ function among contemporary philosophers. She also points out that it shares and is sympathetic to some of the assumptions of the computer metaphor of brain function. Like Edelman, while recognizing the usefulness of the computer metaphor for some levels of analysis, Churchland considers the “brain is like (or is) a computer” theory inadequate, or not a theory at all:

The dominant metaphor of our time likens the brain to a computer, though this dominance is owed perhaps less to tight-fitting similarities than to the computer’s status as the Technological Marvel of our time. Only in a very abstract sense is the brain like a computer: ...

She concludes that the claims for the autonomy (irreducibility) of psychology are “misbegotten.”

If, as Churchland tells us, functionalism is the dominant theory of ‘mental’ function among contemporary philosophers and the computer analogy the dominant metaphor (or simile), it behooves general-semanticists to evaluate them. Patricia Churchland’s Chapter 9 provides an excellent guide and analysis for that purpose.

The final full chapter of Neurophilosophy, Chapter 10 (‘Chapter’ 11 is two pages ‘long’) is called “Theories of Brain Function.” Here Churchland’s goal is to reach beyond (extrapolate from and
interpolate to) the cellular level of nervous system dynamic structure to theories of how brains work as systems – systems of neurons and attending structures. Chapter 10, as we might expect, represents the culmination of her book.

In this chapter she summarizes some (not ‘all’) present-day theories of how brains may work. She does it thoroughly, clearly and consciously, i.e., with a rich awareness of what she’s doing. Here is her chapter program: 10.1, “Introduction,” in which she sets the scene, suggesting necessities and risks involved in theorizing about brain functions. This section is rich in epistemological insights and observations; highly recommended. In 10.2, “In Search of Theory,” she addresses (again) the question of whether or not “anywhere there was a kind of ‘Galilean combination’: the right sort of simplification, unification and, above all, mathematization – not necessarily a fully developed theory, but something whose explanatory beginnings promised the possibility of real theoretical growth.” (407) A hearty welcome to the world of general-semantics. 10.3, “Tensor Network Theory,” presents her first theory for consideration. She shows some lingering elementalism here, willing as she is to tolerate the “co-evolution” of “functional and [italics mine: RPP] structural hypotheses.” Even “co-evolution” is not sufficient, suggesting as it seems the evolution of two separate ‘things’. What I say here does not constitute a quibble. Churchland so often comes so close to a Korzybskian neurolinguistic sensibility, it seems mildly sad that she doesn’t quite make it. Again, as I suggested above, maybe when she reads Science and Sanity .... Nevertheless, sound descriptive writing.

10.4, “Cartoon Story of What a Tensor Does in Sensorimotor Control,” describes a Hofstaderian robotics fantasy involving “Roger,” a “very simple crab-like critter.” The concern here is to mimic sensorimotor coordination as a way to ‘explain’ some aspects of brain function. A detailed, somewhat mathematized exposition: necessary, since, as has been reported, “the devil is in the details.” 10.5, “Tensor Network Theory and the Vestibulo-Ocular Reflex,” gets more explicitly neurobiological. “The VOR [vestibular-ocular reflex] is the neuronal arrangement whereby a creature can continue to look at an object even though the head moves in any of its possible directions ....” (p. 433)

10.6, “Phase Space Sandwiches,” constitutes “A further demonstration of the fertility of the tensor network ....” (p. 441) “Phase space” can be understood by us general-semantics as levels (orders) of abstracting located. Don’t be shy about that. A. R. Luria ‘legitimized’ that sort of insight decades ago. [17] And it seems to me that a uni-substantialist orientation requires that we overcome whatever ‘localization’ (minus identification) inhibitions we may have. Again, a well specified, suggestively diagramed section. (A not so unimportant aside: note how well uni-substantialism correlates with non-elementalism.)

10.7, “Tensor Network Theory: Further Questions” addresses, among others, the question, related to learning, “whether the tensor network theory approach can accommodate some kinds of plasticity.” (p. 446) Of course, to be worth a darn, it had better. Andras Pellionisz, whom Churchland has been much drawing on here, “envisages a hierarchy of nested geometries that interact with one another and with the external geometry.” (p. 448) 10.8, “What Has Motor Control to Do with Mental States?”, seems so obvious to me that, at first, I abstracted a mild shock in reading it. (Given our organism-as-a-whole orientation and our recognition that all living constitutes action, the general-semanticist reader might not be surprised at my mild shock.) Yet it needs to be asked in such a presentation as Churchland’s. As she says, “higher functions are surely not discontinuous with lower functions; they are not a sphere unto themselves.” (p. 451)
10.9, "Computational Models of Neuronal Computation," begins with the statement, pace Sejnowski, Hinton, et al., although she does report some of their work approvingly, "Within the AI [Artificial Intelligence] community there is a growing dissatisfaction concerning the adequacy of sequential models to simulate the cognitive processes of creatures with brains." (p. 458) She details why this is so ("... they have been disappointing in the simulation of fundamental cognitive processes such as pattern recognition and knowledge storage and retrieval,"), and proceeds to discuss connectionist approaches, the growing disappointment with "top-down" (potentially Platonic) orientations, etc. These presentations might well be read in conjunction with Gerald Edelman’s primarily “bottom-up” formulations. An interesting notion appears in the section titled “Relaxation: Searching for the Best Hypothesis,” in which “relaxation” appears as a kind of benign collapse: “The general idea of relaxation is that a network converges on a global result on the basis of local interactions, where units have access to the responses of their neighbors and adjust their own responses according to how their neighbors are responding.” (p. 464) The notion of “iterative modification” (cf. Edelman) is introduced as a mechanism that provides for the eventual “relaxation” of a given network into “a stable, optimal state,” or, as we might say, dynamic equilibrium. 10.10, “The Neurobiology of an Attentional Operation,” Churchland’s final example of recent theoretical developments, deals with Francis Crick’s speculations about the neurobiological mechanisms that subserve visual attention. (pp. 474-478)

She begins her account with a statement of the ‘problem’ of what I have called (in lectures) emerging or constructed gestalts: how is it that our perceptions, which are unitary (images, etc.) arise from dispersed cellular activity of the (in this case, visual) cortex? The possibility of these combinations being “hard-wired in” is ruled out because there’s not enough neuronal hardware to account for the brain’s observed plasticity in image generation. Crick’s suggestion is that there must be temporary associations of cells that generate gestalts, which allows the same cells to participate in the generation of other gestalts at another ‘time’. Combinations of various orders under the rubric of space-time dynamism. One more welcome to the world of Alfred Korzybski.

There’s more to this section of Chapter 10 (accounting for relatively ‘permanent’ cell assemblies subtending word recognitions, etc.) but enough has been reported to suggest that here, too, is material important for a general-semanticist to evaluate.

Chapter 11, “Closing Remarks,” is appropriately short – two pages. Among her observations here is that the current formulational revolution resulting from brains studying brains “will be at least the equal of the Copernican and Darwinian revolutions.” Korzybski thought so in the 1920’s.

Chapter 11 is followed by few but useful notes for the whole book. There is a very extensive bibliography (834 items, including Edelman but not Rose) for those who want to check Churchland out and/or study further.

As recorded in endnote 1, I reviewed Steven Rose’s earlier, excellent book, The Conscious Brain, in 1978. I sent him a copy and he responded with a gracious letter of thanks and demurrers about how laudatory the review was. This time around we might not have that problem.

I do recommend that Bulletin readers study Rose’s The Making of Memory: From Molecules to the Mind. In my earlier review I remarked that “Rose discusses these issues [social implications of neurobiology] from the point of view of what might be called a gentle Marxism – not at all doctrinaire,
but concerned. The non-Marxist reader seems not likely to experience any violent aversive response here.” [14] That may not be the case with The Making of Memory. His first chapter seems filled with semiparanoid populist, communitarian assertions that might be more appropriate in a high school debate where the affirmative side is defending the proposition, “The establishment (parents in disguise, authority in general) plans our misuse. ‘They’ are not to be trusted – like, ever.” Rose opts for the ‘collective’ as the proper subject of scientific study, while downplaying the importance of the individual. Clearly, the ‘collective’ representing a high order abstraction (formulation) generated by interactive individuals, both must be studied with equal concern and assiduity. He also presents a view of ‘classical’ science which verges on caricature and which, if ever appropriate, surely hasn’t been so for the last hundred years. (Roentgen discovered X-rays in 1895; Becquerel, Marie Sklodowska-Curie and Pierre Curie radioactivity (which Marie named) in 1896; Łukasiewicz (indeterminacy), Korzybski and Heisenberg formulated “uncertainty” during the first three decades of our century; Popper called for “disconfirming” attempts as tests of scientific claims in the 1930s, etc. etc.)

Here are some of Rose’s sentences and phrases which I deem inappropriate in what is ostensibly a report to the general public on what he’s been up to as a neuroscientist: “..profound chasm that has developed within the fragmented culture of a western industrialized society, a chasm that the very power and professed objectivity of science are seen by some as deepening.” (p 7); “...the sciences that can account for its [human openness to environments] consequences are no longer those of individual psychology and neuroscience, but of the collective of individuals who comprise human society.” (p. 7); “We may feel superior to those who prefer astrology and tarot cards to astronomy and statistics, but it is a superiority tinged with anxiety.” (p. 10); “As one of the radical critics of a reductionist science in the last decades, I have taken my own part in these debates, and I have lived the best part of my life with a feminine sociologist of science whose searching exposure of the nature of a masculinist and largely white science as it is practiced in western capitalist societies will soon reveal the weak places in any uncritical defence [British spelling] of a science which refuses to recognize its limitations.” (p. 11); “Democracy is about the control of power. I am sufficiently a political product of the 1960s to continue to believe that if knowledge is not democratized, power can never be — ...” (p. 11); no mention of the requirement that the ‘democratization’ of knowledge requires study among the democrats.

When these attitudes surface in Rose’s text, I experience unintegrated dissonance, unexpected in this context; the difference between dissonance in, say, Mozart and some ‘modern’ composer who hasn’t fully digested the role of dissonance in music, and makes mere empty noise. I am not objecting to Rose’s announced intent to reveal how he functions as a neuroscientist, laboratory behavior, the politics of grant reception, etc. Indeed, that constitutes for me a fascinating, honest aspect of his presentation. I do object to being proselytized along with my dose of neurobiology. Rather like having to listen to a sermon at the Salvation Army shelter while cooking aromas fill the dining room.

This caveat aside, there is much to learn and admire in Steven Rose’s well-written book. Let’s look at some of it.

Early on he states a position that I have touched on in this review:

...when I talk about ‘the methods of science’ in this somewhat formal way I certainly don’t mean ‘the methods of nineteenth-century physics’ as if there were only one science – as if a slightly old-fashioned view of physics, actively propagated by traditional philosophers of
science and all school teaching, was what every different science, from chemistry to psychology and economics, aimed to become. [See John Searle’s warning, p. [31] above.]

What I mean by science and its methods is something a good deal broader and less restrictive: a commitment to a unitary materialist [uni-substantialist?] view of the world, a world capable of exploration by methods of rational inquiry and experiment. ...

The workings of the mind, I repeat, are to be described in terms of the properties, structures and processes of the brain. (p. 4)

Rose makes a disclaimer with regard to an attempt on his part to ‘explain’ the workings of the ‘mind’. Apparently, for him, “description” does not equate with “explanation.” Perhaps that’s because he can still (1992) make such statements as this: “The simultaneous translation offered by the Rosetta stone became a code-breaking device, and for me it is a metaphor for the task of translation that we face in understanding the relationship between mind and brain.” [My italics: RPP] That elementalism that I have highlighted by italicizing between suggests that Rose is not yet a uni-substantialist, though committed in his research to describing only ‘material’ structures. And it is his very descriptions that I recommend for study by practitioners and students of general-semantics. However, he seems at a neurolinguistic, neuroepistemological crossroad, from which he might find his way through a thorough reading of Science and Sanity.

Rose’s main concern in The Making of Memory is to describe the dynamic structures/mechanisms of remembering. After important chapters dealing with methods, history, epistemological considerations, metaphors for memory, etc., the descriptions begin in earnest with Chapter 5, “Holes in the Head, Holes in the Mind.” The chapter begins with strong examples of eidetic (sharply visual) memory. He relates these to the need to forget in order to function, i.e., memory must be selective for the job (or day) at hand. This is further illustrated by a consideration of the differences between child and adult remembering.

Many, if not all, young children apparently do normally see and remember eidetically, but this capacity is lost to most as they grow up. What is in young children an apparently general capacity has become a remarkable rarity in adults. This change in the quality of memory perhaps also helps to account for the very different ways we remember our childhood experience and our adulthood. (pp. 103-104)

Rose characterizes this as a “dramatic change in what would seem to be a fundamental human activity.” (p. 104) He describes the selecting/filtering process whereby memories are constructed:

... for humans, to memorize something is an active process. ... we select salient information that we need to commit to memory from the blooming, buzzing confusion of the environment around us. To help in the process, we possess quite elaborate blocking or filtering devices to prevent new information from cluttering up our memories.

For instance, there is a mechanism called perceptual filtering which ensures that, of all the information arriving at one’s eyes or ears at any given time, only a small proportion is actually registered ... (p. 104)
As we general-semanticists know, sometimes that works well – we abstract. [19]

The mechanism of perceptual filtering is described as a mechanism of mapping; let’s call it neuromapping. The description will likely sound familiar to readers of this journal. The necessary, individual focusing it represents is, of course, potentially distortive of the relationship between the environment and the mapping organism: how close is the *match* between the map and the territory is what counts.

As a function of the maturing of these space-time process-mechanisms, memories become more and more linear. (Let’s remember that even “non-linear” equations qualify as a subset of meta-linear [i.e., overarching linear] space-time formulations. Life is an irreversible process. Old ways of talking need to be replaced.

Rose proceeds to specify the relationship between behavior and neuro-structure by examining cases of Alzheimer’s and Korsakoff’s syndrome. (I [RPP] once jotted down a ‘definition’ of ‘schizophrenia’: Rimsky- had Korsakoff’s Syndrome, but -Korsakoff did not.)

... the brains of Alzheimer’s sufferers shrink and the neurons themselves change their appearances; their internal structures become disorganized, forming patterns which, because of their appearance under the microscope, are called jungles and plaques. (p. 111)

This can deepen our understanding of Korzybski’s “Structure is the only ‘content’ of knowledge.”

On page 121 Rose makes the point that tissue trauma ‘generates’ functional deficit but, careful scholar that he is, reminds us that much remains to be specified in this relationship. His wariness in these circumstances may derive from his persistent elementalism. Here are some things he says, all on one page (123):

... the person who owns that brain ...
... the brain is embedded in a person ...
These properties are intrinsic to brains and the humans who possess them, ...

Such expressions mystify the presentation and seem the likely source for his shyness in accepting the ‘fusion’ of structure-function. (I put ‘fusion’ in quotes to emphasize my Korzybskian view that we are not dealing here with a fusion of discrete phenomena, but a structured totality mistakenly [historically] split by long-established linguistic convention.)

Chapter 6, “Animals Also Remember,” can be read with profit in conjunction with Edelman’s evolution-as-selection discussions, especially as a correction for what might be seen as Rose’s incipient Lamarckianism. Nevertheless, I found instructive the formulating on page 138 about genes involved in (as I would put it) relative invariance under transformation (the stable ‘background’ [specificity] that allows change [plastic restructuring] to happen without collapse into ‘chaos’). On page 139, Rose gives us a clue to the neurostructure of abstracting: “The fact that there are many more retinal cells than optic nerves to which they connect means that each nerve integrates information from many individual cells.” This is a very Lurian and, it seems to me, sound observation.

One more passage from this chapter can (many more could) focus our attention:
If the brain is to interpret images arriving at the retina of the eye, these pathways, with their compressions and expansions, have to be organized in an orderly manner – and indeed it can be shown that there is a precise topographic mapping of the retina onto the neurons of the lateral geniculate and a further mapping of these cells onto those of the visual cortex. That is, there is a type of map of the retina in the lateral geniculate, and a further map, albeit transformed at least as much as Mercator’s projection transforms the globe of the world into a two-dimensional plan on a classroom wall [my italics: RPP], in the visual cortex. At each level of mapping, from the retina to the geniculate to the cortex, analysis of the information occurs so that it is classified in terms of signals for edges, angles, movement, light of different wavelengths (colour), etc. In the cortex further mapping and classification by increasingly complex criteria occur to generate the pattern of neural activity which we define as vision and perception. (p. 139)

Chapter 7, too, “The Evolution of Memory” can be read alongside Edelman’s evolutionary formulations. Like Edelman, Rose rejects the quantum level of analysis as useful for a starting ‘place’ for describing evolutionary processes, particularly as related to brains. They don’t say why. Perhaps it’s because they see quantum level stuff as the same (unevolved) since the presumed ‘big bang’. Something like that must be the assumption of cosmologists who make far-reaching inferences about the age and history of the ‘universe’ based on present observations. Be that as it may, Rose selects the molecular level as fundamental. Thus the subtitle of his book and the title of Chapter 8, “Molecules of Memory.” Here the emphasis is on the biochemistry of brain function (Rose describes himself as primarily a biochemist), the biochemistry of memory in particular. The subtle complexity of such considerations is indicated in a footnote to page 199:

... that even a simple chemical interference with a complex biochemical process results in multiple effects is a graphic example of the folly of the pharmaceutical industry’s way of speaking about the ‘side effects’ of drugs. Introducing an exogenous chemical like a drug into the body has a multitude of biological consequences, some anticipated, others unexpected – but never ‘side-effects’. The phase [sic: should be “phrase”] is a misnomer, concealing the reality that such consequences are inevitable, even though they are ones that the researcher or the clinician doesn’t want or hadn’t thought about. No drug is a ‘magic bullet’ with only a single target.

A great strength of this chapter in particular is that Rose makes his presentation as a series of questions to which he gives historical and current answers, then raises questions about the answers, including his own. Indeed, this may be the greatest strength of Steven Rose’s entire book: his persistent willingness to expose himself as research scientist-epistemologist at work. He repeatedly show us “that man behind the curtain” and, unlike the Wizard of Oz, urges us to pay attention to him.

Chapter 9, “God’s Organisms? Sea Slugs and Sea-Horses,” sets out and details criteria Rose formulated to guide his research in the biochemistry of memory. These seem so instructive to me that I will list them here for you, dear reader, to reflect on:

[1] There must be changes in the quantity of the system or substance, or the rate of its production or turnover, in some localized region of the brain during memory formation. (p. 207)
The time course of the change must be compatible with the time course of memory formation. (p. 208)

Stress, motor activity or other processes which accompany learning must not, in the absence of memory formation, result in the structural or biochemical changes. (p. 210)

If the cellular or biochemical changes are inhibited during the period over which memory formation should occur, then memory formation should be prevented and the animal [or human] be amnesic; and vice versa. (p. 211)

Removal of the anatomical site at which the biochemical, cellular and physiological changes occur should interfere with the process of memory formation and/or recall, depending on when, in relation to the training, the region is removed. (p. 212)

Neurophysiological recording from the sites of cellular change should detect altered electrical responses from the neurons during and/or as a consequence of memory formation. (p. 213)

Again, reading this chapter and its detailed explanations of research on particular organisms-with-nervous-systems provides us non-laboratory readers with sturdy data which we can use as we consider correspondences between-among neural structure-functions and behaviors such as formulating ('thinking'), painting, musicing – even attempts to escape ('transcend') ourselves as nervous systems: mysticism.

The discussion (still in Chapter 9) of long-term potentiation (LTP), pp. 227-240, seems particularly instructive, especially as a cautionary tale about what I'll call “premature specificity”: rushing to inferences already implied in your research questions, then identifying (in the Korzybskian sense) your conclusions with what you're describing. Taking your inferences for facts. We are reminded here of the need to maintain a probabilistic, uncertaintist stance, even in the presence of the most ‘successful’ research.

The “Six Criteria” generate in Chapter 10 (“Nobody Here But Us Chickens”), on pp. 247-271, detailed descriptions of their application in Rose’s laboratory work on chick brains.

Chapter 11, “Order, Chaos, Order: The Fifth Criterion,” returns to the concern for situations in which brain lesions do not produce expected deficits. [20] I was reminded here of Edelman’s strong statements about the uniqueness of brains, particularly human ones. Generalized expectations may not always apply. This is perhaps, for a general-semanticist reader, Rose’s core chapter, for here he most forthrightly brings together the epistemological, procedural and self-challenging stances that energize his research and show his position as of 1992. And here he plainly faces up to his struggle with ‘reductionism’, of which more below.

Chapter 12, “Interlude: Laboratories Are Not Enough,” is again autobiographical and interesting, but will not detain us here. I can recommend it for those who are interested in the methods and politics of science practice, especially for young readers who may be about to embark on a career therein.

The final chapter, 13, “Memories Are Made of This” (thus, quoting a popular song. Rose reminds his readers of his populist impulses), summarizes the main points of The Making of Memory. Steven Rose reminds us, too, that his mission has been as much literary as ‘scientific’. He quotes Gayle Green as saying that “All writers are concerned with memory, ...” But, writes Rose:
... this book is about memory seen from the, **perhaps peculiar** [my italics: RPP] – perspective of the neuroscientist. (p. 308)

I wrote in the margin of my copy, “Don’t apologize, Steve. Not peculiar; more structurally sound.” Then Rose writes this:

... the brain processes that are in increasingly well-understood ways responsible for memory (even, I would maintain, are memory) – (p. 308)

That, despite Rose’s prior and later disclaimers, sounds pretty reductionist to me – precisely what Edelman called “silly reductionism” and what I have referred to earlier in this review as “reductionism with identification.” But Steven Rose is nothing if not flexible, a flexibility seemingly born of what general-semanticists call “consciousness of abstracting”:

Why should I worry if I abandon my lab persona and its reductionist epistemology when I close the door of the animal house and switch off the centrifuge?

...I have no option but to accept that we do indeed all live with such different epistemologies; when I try to remember the name of the person who phoned me a few moments ago I don’t consciously do so in terms of protein phosphorylation or neuronal bursting. But I have no difficulty in accepting that these processes are going on as I make my memory and that in some way which I still only partially understand they can be translated into that memory.

Let’s conclude this review with some observations about reductionism and metaphor, a double concern of all three of our writers. I deem it the case that any neuroscientific attempt to describe/explain the ‘mind’/brain must be inescapably reductionist in the sense that Patricia Churchland uses that term: the explaining of one domain of discourse in terms of another. Despite their reservations, both Edelman and Rose are doing it. The hitch comes with the problem of identification, i.e., confusing orders of abstracting: something evaluating brains routinely do. What seems needed is a mathematized, probabilistic, uncertaintist, non-identifying reductionism – clear-eyed but tentative.

Explaining one domain of discourse in terms of another (a deeper yet broader) domain of discourse inescapably involves us in metaphorical behavior, i.e., metaphor-making and simile-making behavior. If I struggle to formulate so that the structures of (relationships of) my formulations fit-match (are ‘like’) the structures/relations of the eventually non-verbal stuff I’m talking about, I will be engaged in metaphor and simile production. The question, then, becomes what metaphors, what similes seem structurally appropriate – and can I consistently operate under the rubric of consciousness of my own abstracting.

Edelman and Rose reject the computer model (information processing machine, logically-functioning neural networks, etc.) of the brain, not because they deny that brains do those things that computers do (after all, computers are designed by human brains), but because they consider that ‘reduction’ too limited and, in Edelman’s case, object to the notion that there is *a priori* ‘software’ which runs on neural ‘hardware’. I have indicated above the models they struggle with. Patricia Churchland is less aversive, yet also wary:
The computer metaphor should be handled with extreme caution. As we have seen, the theory of levels borrowed from computer science defines prematurely and inappropriately the levels of organization of the brain. (Churchland, p. 384)

That seems anachronous: theories of levels preceded and contributed to the development of computer science (cf. Russell, Chwistek, Korzybski, et al.), but the metaphor point seems valid.

An important job for serious students of general-semantics is to read their texts, discover why they say what they say, then 'put it up' on the Structural Differential.

Endnotes


2. See the header quote to Chapter 19 (p. 188) from Julien Offray de la Mettrie, which begins: “It is clear that there is but one substance in the world, and that man is its ultimate expression.”


6. I claim that all of this and more is abstractable from Science and Sanity and Korzybski’s other writings. See especially two remarkable chapters in Science and Sanity, XVIII, “Mathematics as a Language of a Structure Similar to the Structure of the World,” and XIX, “Mathematics as a Language of a Structure Similar to the Structure of the Human Nervous System.”

8. Jacob Bronowski, *The Ascent of Man*. Boston/Toronto: Little, Brown and Company, 1973. Bronowski gave the sixteenth Alfred Korzybski Memorial Lecture before the Institute of General Semantics (or members thereof) at the Harvard Club, New York, April 7, 1967. In contrast to Edelman, Bronowski does see ‘error’ at the heart of evolution, but fortuitous error: “The nature of life is only expressed in its perpetual evolution, which is another name for the succession (and the success) of its errors.” He further states, “The principle of natural selection is the second strand in evolution; it is what gives the observations a structure and turns them into a theory. Selection is not strictly a causal mechanism, but a statistical one; and evolution is therefore the work of chance.” See “Towards a Philosophy of Biology,” *General Semantics Bulletin*, No. 34, 1967. (1968), pp. 17-22.


12. The next time your physician (who took the Hippocratic Oath) tells you, “It’s all in your mind,” say “Yes. Now let’s get on to fixing it, if we can.” The quote from Hippocrates (c. 460-377 BCE) reminds us of how long this insight and its related debates have been around.

13. Paul Churchland is well-enough known to have been quoted in *Scientific American* speaking against what is known as “folk psychology” in favor of “...an entirely new kinematics and dynamics with which to understand human cognitive activity, one drawn perhaps [contra Edelman: RPP] from computational neuroscience and connectionist A.I. [Artificial Intelligence].” Dr. Churchland is also credited with urging the application of advanced mathematical formulations to modeling higher order human brain functions, a la Korzybski’s call related to “combinations of higher order.” See *Scientific American*, Special Issue, Mind and Brain, September, 1992, p. 180.


15. There is much of value to see in the noble Kotarbiński’s work (he was a genuine hero of civilization). These are some of the most conveniently available sources for English-reading scholars:


__________, *Philosophy and Ideology: The Development of Philosophy and Marxism-Leninism in


19. For a brief summary of Korzybski’s view of abstracting, see Robert P. Pula, “A General Semantics Glossary (Part III),” ETC.: A Review of General Semantics, Vol. 49, No. 4, Winter 1992-93, pp. 470-473. It begins: “A most useful thing to do when first encountering the term abstracting as used in general-semantics is to divest yourself of your accustomed reactions to the term as used in the culture-at-large. ... First and foremost, abstracting is intended to describe the major mechanisms by which human nervous systems/brains respond to and organize behavior. [my italics: SAM] Abstracting, then, details a process, i.e., an activity with specifiable phases: ...”